

Claims:

1. A catalyst composition wherein the catalyst has at least one imine linkage and at least one tertiary amine moiety wherein the imine linkage is obtained by the reaction mixture comprising (i) a compound having at least one aldehyde or ketone moiety and (ii) a compound having at least one primary amine moiety wherein the tertiary amine moiety is present on the compound of (i), the compound of (ii) or on both compounds of (i) and (ii).

2. The catalyst of Claim 1 wherein the compound having a ketone or aldehyde moiety further contains a tertiary amine moiety.

3. The catalyst of Claim 1 wherein the compound having a primary amine moiety further contains a tertiary amine moiety.

4. The catalyst of Claim 1 wherein the ketone is represented by $R-C(O)-R^1$ where R and R^1 are independently a C1-C20 substituted or unsubstituted linear or branched alkyl, a cyclic, heterocyclic or aromatic compounds containing 4 to 20 atoms or R and R^1 are bound to each other to form a ring structure containing 5 to 20 atoms in the ring.

5. The catalyst of Claim 1 wherein the aldehyde is represented by $R-C(O)-H$, wherein R is a C1-C20 substituted or unsubstituted linear or branched alkyl, a cyclic, heterocyclic or aromatic compounds containing 4 to 20 atoms.

6. The catalyst of Claim 1 wherein the compound having both primary and tertiary amine moieties is represented by the formula:

$H_2N - R^8 - N(R^9)_2$ where R^8 is an aliphatic or cyclic chain having 1 to 20 carbon atoms and R^9 is a C1 to C3 alkyl group.

7. The catalyst of Claim 1 wherein the compound having both primary and tertiary amine moieties is 3-(dimethylamino)-propylamine, 1-(3-aminopropyl)-imidazole, 1-(3-aminopropyl)-2-methylimidazole, N,N-dimethyldipropylenetriamine, N,N-dimethylethylene diamine, N,N-diethylethylene diamine, N,N-

dibutylethylene diamine, 3-(diethylamino)-propylamine, 3-(dibutylamino)-propylamine, N,N,2,2-tetramethyl-1,3-propanediamine, 2-amino-5-diethylaminopentane, N-methyl-(N'-aminoethyl)-piperazine, 1,4-bis(3-aminopropyl)piperazine, 3-aminoquinuclidine, 4-(2-aminoethyl)morpholine, 4-(3-aminopropyl)morpholine, N,N-dimethyl-1,4-phenylenediamine, 5-amino-1-ethylpyrazole, 2-aminopyridine, 2-(aminomethyl)pyridine, 2-(aminoethyl)pyridine, 4-aminopyridine, 3-aminopyridine, 3-(aminomethyl)pyridine, N-aminopropyl pyrrolidine 2-aminopicolines, diaminopyridines, 2-aminopyrimidine, 4-aminopyrimidine, aminopyrazine, 3-amino-1,2,4-triazine, aminoquinolines, N,N dimethyldipropylenetriamine and 3,3'-diamino-N-methyl dipropylamine, N-methyl-1,3-propylidiamine

8. The catalyst of Claim 1 obtained by the reaction product of a compound containing at least one tertiary amine and at least one aldehyde or ketone moiety group with a compound containing a primary amine.

9. The catalyst of Claim 8 wherein the compound containing ketone and tertiary amine moieties is represented by the formula $(R^2)_2N-R^3-C(O)-R$ wherein R is a C1-C20 substituted or unsubstituted linear or branched alkyl, a cyclic, heterocyclic or aromatic compounds containing 4 to 20 atoms, R^2 is a C1-C6 linear or branched alkyl and R^3 is a C1 to C12 linear or branched alkyl, an aromatic or alkyl aromatic moiety having 6 to 20, substituted with at least one tertiary amine; or R^3 is a cyclic or bicyclic moiety having 5 to 20 atoms wherein at least one nitrogen is included in the ring structure; or R^3 and R may be bound to each other to form a ring structure having 5 to 20 atoms.

10. The catalyst of Claim 2 wherein the compound containing aldehyde and a tertiary amine moieties is represented by the formula $(R^2)_2N-R^3-C(O)H$ where R^2 is a C1-C6 linear or branched alkyl and R^3 is a C1 to C12 linear or branched alkyl, an aromatic or alkyl aromatic moiety having 6 to 20, substituted with at least one tertiary amine; or R^3 is a cyclic or bicyclic moiety having 5 to 20 atoms wherein at least one nitrogen is included in the ring structure; or R^3 and R are

bound to each other to form a ring structure having 5 to 20 atoms.

11. The catalyst of Claim 1 wherein the compound containing a primary amine is N,N-dimethyldipropylenetriamine, 5 3,3'-diamino-N-methyl-dipropylamine, 3-aminopropyl-N-methyl-ethanolamine and 3-(dimethylamino)propylamine.

12. The catalyst of Claim 1 which is the reaction product of the steps comprising;

10 (a) a mixture of (i) a compound containing at least one epoxy moiety with (ii) a compound containing an epoxy reactive moiety and an aldehyde or ketone moiety and

(b) mixing the product of step (a) with a compound containing at least one primary amine and at least one tertiary amine moiety.

15 13. The catalyst of Claim 12 wherein the epoxy reactive moiety is an alcohol, amine, thiol or carboxylic acid.

14. The catalyst of Claim 12 wherein the compound having an aldehyde moiety and an epoxide reactive moiety is a C3 to C30 aliphatic, aromatic or polyaromatic compound or a ring 20 structure containing a heteroatom, with the proviso when the compound having an aldehyde and epoxide moiety contains a ring structure, the aldehyde moiety is bonded directly to the ring and the epoxide reactive moiety is bonded directly to the ring or bonded to the ring via a C3 to C6 linear or branched alkyl.

25 15. The catalyst of Claim 14 wherein the compound having an epoxide reactive moiety and an aldehyde moiety is salicylaldehyde, vanillin, 5-(hydroxymethyl)-furfural, 3-hydroxybenzaldehyde, 4-hydroxybenzaldehyde, dihydroxybenzaldehydes, trihydroxybenzaldehydes, 2-30 carboxybenzaldehyde, 3-carboxybenzaldehyde or a mixture thereof.

16. The catalyst of Claim 12 wherein the compound having a ketone and an epoxide functional moiety is a C3 to C30 aliphatic, aromatic or polyaromatic compound or a ring structure containing a heteroatom with the proviso when the compound 35 having a ketone and epoxide moieties contains a ring structure, the epoxide reactive moiety is bonded directly to the ring or bonded via a C1 to C6 linear or branched alkyl.

17. The catalyst of Claim 13 wherein the compound having a ketone and epoxide functionality is 2'-hydroxyacetophenone, 4'-hydroxyacetophenone, 3'-hydroxyacetophenone, 3-acetyl-1-propanol, 4-hydroxy-3-methyl-2-butanone, 4-hydroxy-4-methyl-2-pentanone, 4'-hydroxyvalerophenone, dihydroxyacetophenone, benzyl-4-hydroxyphenylketone, acetovanillone, 3'-aminoacetophenone, 4'-aminoacetophenone, aminobenzophenone, 4-acetylbenzoic acid, 2-benzoylbenzoic acid or a mixture thereof.

10 18. The catalyst of Claim 12 wherein the compound containing at least one epoxide moiety is represented by the formula:



15 wherein R^4 is substituted or unsubstituted aromatic, aliphatic, cycloaliphatic or heterocyclic group and n has an average value of from 1 to 8.

19. The catalyst of Claim 12 wherein in step (a) the mixture further contains a phenol, cresol, bis phenol A, 20 bisphenol F, a novolak polyol, ethylenediamine, 3,3'-diamino-N-methyl-dipropylamine, resorcinol, adipic acid, succinic acid, isophthalic acid, phthalic acid, terephthalic acid, acidic acid, or a combination thereof.

20. The catalyst of Claim 12 wherein in step (b) the compound containing a primary amine and a tertiary amine moieties contains two or more primary amines.

21. The catalyst of Claim 1 formed by the reaction of an amine terminated polyol with a compound containing a tertiary amine moiety and an aldehyde or ketone moiety.

30 22. The catalyst of Claim 12 wherein 1 to 50 percent of the epoxy moieties present in step (a) are reacted with a compound containing an epoxy reactive group and a tertiary amine moieties.

35 23. The catalyst of Claim 1 which is the reaction product of an isocyanate with a compound having at least one

alcohol or amine moiety and at least one aldehyde or ketone moiety.

24. A polyol composition containing from 99.9 to 50 percent by weight of a polyol compound or blend of polyols having a functionality of 2 to 8 and a hydroxyl number of from 20 to 800 and from 0.1 to 50 percent of a catalyst composition wherein the catalyst has at least one imine linkage and at least one tertiary amine group.

5 25. The polyol composition of Claim 24 wherein the polyol or blend of polyols has an average hydroxyl number of from 20 to 100.

10 26. The polyol composition of Claim 25 wherein the catalyst composition is a catalyst of any one of Claim 1 to 23.

27. A process for the production of a polyurethane product by reaction of a mixture of

15 (a) at least one organic polyisocyanate with

(b) a polyol composition wherein the polyol has a calculated nominal functionality between 2 to 8 and a hydroxyl number of from 20 to 800 and

20 (c) at least one non-fugitive catalyst containing at least one imine linkage and at least one tertiary amine group

(d) optionally in the presence of another catalyst and/or blowing agent; and

25 (e) optionally additives or auxiliary agents known per se for the production of polyurethane foams, elastomers or coatings.

28. The process of Claim 27 wherein the catalyst is present in an amount from 0.1 to 50 weight percent of the total weight of (b) and (c).

29. The process of claim 27 wherein the catalyst is 30 a catalyst of any one of Claims 1 to 23.

30. The process of Claim 29 for producing a flexible polyurethane foam wherein the polyol composition has a hydroxyl number from 20 to 100 and the blowing agent is water in an amount of 0.2 to 10 weight percent of the polyol.

35 31. A flexible polyurethane foam made by the process of Claim 30.

32. The process of Claim 29 for producing a rigid polyurethane foam where the polyol composition has an average hydroxyl number from 200 to 1000 and the blowing agent is water in combination with a hydrocarbon or a hydrofluorocarbon.

5 33. A rigid polyurethane foam made by the process of Claim 32.